

REMARKS

Claims 1-4, 6, 8-11 and 13-25 are pending in this application. For the reasons set forth below, Applicants believe that the rejection should be withdrawn and that all currently pending claims are in condition for allowance.

REJECTION OF CLAIMS 1-4, 6, 8-11 AND 13-25 UNDER 35 U.S.C. 103(a)

The Examiner maintained the rejection of claims 1-4, 6, 8-11 and 13-25 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,800,623 to Brockhaus ("Brockhaus") in view of one of U.S. Patent No. 6,554,524 to Smith, U.S. Patent No. 3,827,820 to Hoffman, U.S. Patent No. 1,984,350 to Halsey, or U.S. Patent No. 933,625 to Clarkson.

The present invention relates to a vehicle door hinge. A customer's perception of the quality of a vehicle is influenced by the door margins or the gaps between the door and the surrounding body panels. A vehicle with door margins that are parallel and equidistant is perceived as being higher in quality than one where the door margins are not parallel or equidistant. Most high quality vehicles use a precision joint to hold a vehicle door in place with an accuracy of +/- 0.001 in.

Brockhaus describes a hinge assembly where the accuracy is achieved via a bushed rotary joint in the first hinge leaf 1 and an axially removable joint in the second hinge leaf 3. "The hinge pin 2 is rotatably supported by means of a bushing of bearing material at a cylindrical section 7 thereof in the hinge eye 4 of the first hinge half 1." Column 5, lines 16-18. The bushing has a "running fit." See Column 1, line 17. A running fit for joints of the size contemplated by Brockhaus is typically 0.00065 in., which in effect provides no clearance. The hinge pin 2 is axially retained relative to the first hinge leaf 1 by a collar 10 and a safety element 9. See FIG. 1. This bushed rotary joint is used in each of the four embodiments described in Brockhaus.

Each of the embodiments require free-play in the axially removable joint between the second hinge leaf 3 and the hinge pin 2 to facilitate the removal of the second hinge leaf 3 from the hinge pin 2 and, in turn, removal of the vehicle door. Brockhaus describes

eliminating the free-play once the door is installed by clamping the hinge pin 2 relative to the second hinge leaf 3 to axially and radially constraining the hinge pin 2 relative to the second hinge leaf. FIGs. 1 and 2 of Brockhaus illustrate a first embodiment where the hinge pin 2 is clamped relative to the second hinge leaf 3 via a screw thread 13 formed on a portion of the hinge pin 2 and a corresponding nut 14. The nut 14 clamps the second hinge leaf 3 against the collar 10 of the hinge pin 2. FIGs. 3-5 illustrate a second embodiment where the hinge pin 2 is clamped relative to the second hinge leaf 3 through a combination of mutually co-operable clamping areas (circumferential border 19 and shaping 20, as well as toothed construction 21 and conical construction 22) and a screw 25 which engages with a circumferential groove 24 formed in the hinge pin 2. FIGs. 6, 7 and 9 illustrate a third embodiment where the hinge pin 2 is clamped relative to the second hinge leaf 3 via a bracing pin 32 which engages in a circumferential recess 31 of the hinge pin 2. FIG. 8 illustrates a fourth embodiment which is similar to the first embodiment, but uses a bolt 42 and a corresponding threaded bore 38 to clamp the second hinge leaf 3 against the collar 10 of the hinge pin 2.

As illustrated by each of the embodiments of Brockhaus, the hinge pin is complex and thus expensive to fabricate and install. The complex hinge pin is needed to axially retain the hinge pin 2 relative to the first hinge leaf 1 while allowing rotary movement and to eliminate free-play in the axially removable joint between the hinge pin 2 and the second hinge leaf 3 via some form of clamping arrangement. The collar 10 and the safety element 9 are needed to axially retain the hinge pin 2 relative to the first hinge leaf 1 and require that at least one hinge leaf 1, 3 includes an open ended bore to accommodate the hinge pin 2 and associated safety element 9. An open bore, such as described in Brockhaus, is undesirable since it discloses the location of the hinge pin 2 within the hinge assembly, it permits unauthorized access to the hinge pin, and it allows water or dirt to enter. In addition, an open bore allows the egress of materials, such as lubricant, from within the hinge assembly.

In contrast to Brockhaus, embodiments of the invention include a hinge assembly 10 that requires a pivot pin 15 that is immovably mounted in a first blind bore 30 in one hinge leaf 14 and thus has neither axial nor radial free-play. Accordingly, such an arrangement

does not introduce any free-play into the hinge assembly 10. The pivot pin 15 is rotatably received in a second blind bore 32 in the other hinge leaf 12. The pivot pin is axially withdrawable from the blind bore 32 to facilitate the separation of the first hinge leaf 12 from the second hinge leaf 14 and in turn removal of a vehicle door. Embodiments of the invention achieve zero free-play axial retention and rotary movement of the pivot pin in the first hinge leaf 12 via an engagement means including a spherical surface of a given radius seated in an annular groove of curved section. The curved section has a radius of curvature which is the same as the radius of the spherical surface so that any free-play is eliminated, and so that the hinge assembly 10 is able to maintain the accuracy necessary for modern vehicle door hinges.

The hinge assembly of claim 1 is distinguishable from the hinge assembly in Brockhaus for the following reasons:

- 1) the pivot pin is immovably mounted in a first blind bore in a second hinge leaf 14, and
- 2) the pivot pin is rotatably received and axially withdrawable from a second blind bore in a first hinge leaf with zero free-play axial retention and rotary movement of the pivot pin being achieved by an engagement means including a spherical surface of a given radius seated in an annular groove of a curved section.

As discussed above Brockhaus describes a hinge pin that is either rotatably mounted in an open-ended bore of a first hinge leaf 1 or axially removably mounted in an open-ended bore of a second hinge leaf. Thus, the claimed hinge assembly achieves a high degree of accuracy using a pivot pin that is much simpler than the hinge pin of Brockhaus. Due to its simplicity the pivot pin is less expensive to manufacture than the complex hinge pin of Brockhaus. In addition, the claimed hinge assembly includes a first blind bore and a second blind bore, which provide an advantage over the open-ended bore of Brockhaus. The blind bores conceal the location of the pivot pin when the hinge assembly is mounted on a vehicle, prevent unauthorized access to the hinge pin, prevent the ingress of water/dirt, and prevent the egress of material, such as lubricant from the hinge assembly.

The Examiner admitted that Brockhaus does not describe that the engagement means includes a spherical surface of a given radius seated in an annular groove of a curved section. However, the Examiner alleged that such structure was known to prevent axial movement while allowing for rotational movement and cited Smith, Hoffman, Halsey and Clarkson. The Examiner alleged that it would have been obvious to modify Brockhaus for the purpose of providing alternative means of securing the hinge pin as desired. Contrary to the Examiner's assertion, there is no reason to combine the references in the manner suggested by the Examiner since none of the secondary references describe vehicle hinge assemblies.

Even if Brockhaus is combined with Smith, Hoffman or Halsey, the combination does not describe the invention of claim 1. Smith, Hoffman and Halsey each disclose an engagement means which includes a ball which is biased into engagement with an annular groove of a pin member by a spring. The engagement means does not prevent axial withdrawal of the pin member since if sufficient axial force is applied, the spring retracts and the ball moves out of the annular groove, which allows axial movement and removal of the pin member. Thus, none of the structures described by Smith, Hoffman or Halsey provide the necessary zero-play axial retention of the pin member and prevent axial withdrawal of the hinge pin.

Even if Brockhaus is combined with Clarkson, the combination does not describe the invention of claim 1. Clarkson describes a swivel with first and second end portions 1a, 2a. The first end portion 1a rotatably receives the second end portion 2a and defines a ball bearing arrangement in which plurality of anti-friction balls 7 are located. A threaded plug 8 closes the opening through which the anti-friction balls 7 are loaded into the ball bearing arrangement. Clarkson does not address the ready separation of the first and second end portions 1a, 2a from one another, and thus, there is no reason to combine its structure with the hinge assembly of Brockhaus. The ball-bearing race described by Clarkson teaches away from any combination with Brockhaus since the ball bearing race would further complicate and increase the expense of manufacturing the Brockhaus hinge assembly.

Claim 2 requires that the pivot pin is immovably mounted in one hinge leaf and is rotatably mounted in and axially withdrawable from the other hinge leaf. The hinge pin

retention means prevents axial withdrawal of the hinge pin from the other hinge leaf and the hinge pin engagement means includes a spherical surface of a given radius seated in an annular groove of a curved section, which has a radius of curvature the same as the given radius so as to permit rotation of the hinge pin, but prevent any axial movement of the hinge pin relative to the other hinge leaf. As discussed above in connection with claim 1, these features of claim 2 distinguish it from the cited references.

Claims 3-6, 8-11 and 13-25 depend from claim 2 and are patentable for at least the same reasons as claim 2 and may be patentable for additional reasons as well.

CONCLUSION

Applicant respectfully requests reconsideration of the present application in view of the foregoing remarks. If there are any issues that can be resolved via a telephone conference, the Examiner is invited to contact the undersigned at 404.685.6799. The Commissioner is hereby authorized to charge any additional fees that may be due or credit any overpayment, to Deposit Account No. 11-0855.

Respectfully submitted,

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Docket No. 43191/270021